

becomes one where appropriate artefacts and social groups are brought into being, placated or otherwise pulled into line. Here Triewald failed, though perhaps only marginally, to fit together the bits and pieces needed to make a satisfactory steam engine. More interestingly, he failed to find or train the mechanics that might have persuaded the engine to work more regularly; he failed – indeed he did not even attempt – to rebuild the social relations at the mine in a way that would have rendered Hultberg's job possible; he failed to convince the partners of the success of his engine; and he failed finally to convince the court of the utility of his 'glorious invention' when the case came to trial. In short, he failed as a social engineer, and in consequence his technology was found wanting.

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*Reviews* (continued)

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## Peripheral Science

### Simon Schwartzman

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Elena Díaz, Yolanda Texera and Hebe Vessuri (eds), *La ciencia periférica: ciencia y sociedad en Venezuela* (Caracas: Centro de Estudios del Desarrollo & Monte Avila Editores, CA, 1983), 291pp., n.p.

Hebe Vessuri (ed.), *Ciencia academica en la Venezuela moderna* (Caracas: Fondo Editorial Acta Cientifica Venezolana, 1984), 461pp., n.p.

**Venezuela is an oil-rich country**, and this is certainly related to the extraordinary expansion of its higher education and scientific

establishments in the last twenty years. In 1970 its higher education enrolments included 10.1% of the age cohort, as against an average of 6.8% for all Latin America. This rate doubled in five years (19.5% in 1975), and the figure for 1982 was 21.5%, one of the highest in the continent and approaching European countries like Italy or England.<sup>1</sup> It has also one of the highest rates of researchers and scientific investments *per capita* in the region, and some of its scientists are internationally known and respected.<sup>2</sup> Venezuela not only created schools and provided fellowships for its citizens to study abroad, but also absorbed a significant group of scientists and liberal professionals expelled from other Latin American countries – mostly Argentina and Chile – by their military regimes. Finally, as these two books demonstrate, it has a very competent research group devoted to the social aspects of science in developing regions.

To create schools, to open scientific institutions and to send people to study abroad is not the same as to provide them with adequate and useful jobs, or with a dense and self-sustaining scientific and technological environment. Amneris Tovar and Dióscoro Negretti, in the last chapter of *Ciencia periférica*, make a good summary of the efforts to direct investments in higher education in Venezuela according to the rational canons of the 'human capital' theories. Thanks to the money available, excellent research on Venezuelan higher education was performed, some of it with the participation of scholars from the MIT, but little was achieved in terms of actually fitting enrolments with supposed social needs or labour market demands. Planning was also a central goal of Venezuela's Council of Scientific and Technological Research (CONICIT) during the 1970s. As Marcel Roche and Yajaira Freites show in their contribution to *Ciencia periférica*, the notion that science should be planned (and, therefore, made useful for the country) had wide support among Venezuelan scientists. However, there is enough evidence that scientific planning never actually took place, and this explains, according to Roche and Freites, why the scientists never actually complained about it.

Rapid expansion of formal education and academic institutions in a country known for importing practically all manufactured goods from abroad, with traditionally high illiteracy rates and low enrolments at secondary schools, could not happen without tensions and difficulties. In the early 1960s, Venezuelan university students staged a violent and unsuccessful insurrection against the government. According to Rafael Rengrifo, who writes about sociology in *Ciencia académica*, at the onset students did not try to link their political life with what they learned

in school. After the repression of the 1960s, however, they turned their militancy inwards, towards the university system. The Venezuelan version of the 1968 movements became known as 'La Renovación'. It was a revolution within the universities, affecting the way they were to be governed, the relations between students and teachers, and, for sociology, the enthronement of Marxism as a new orthodoxy. Two years later, the government intervened at the Central University and the revolutionary euphoria was replaced by demobilization, while militant Marxism changed into Althusserianism, Poulantzasism and dependencism. After that, a *modus vivendi* gradually developed: control of educational institutions (and of many other sectors of the public bureaucracy) was left to the intellectuals, including the remnants of the revolutionaries of the 1960s, while the government tried to run its business in alliance with foreign interests, the traditional political parties and some less militant technical élites. It was a clear case of political cooptation of the left, very much in the Mexican style,<sup>3</sup> to be paid for with surpluses from the oil industry.

This drama of rapid social mobility, political radicalization and cooptation provides the background for the 21 articles brought together under the intellectual leadership of Hebe Vessuri in these two volumes. Vessuri herself is a sophisticated Argentinian anthropologist educated at Oxford University and, for many years, leader of the Science and Technology programme of the Centro de Estudios del Desarrollo of the Universidad Central de Venezuela. In her introductory chapter to *Ciencia academica*, she attempts to combine the European and American traditions in social studies of science with the standard '*dependencia* theory' that became mandatory in the Venezuelan social sciences after the *Renovación*. Thus, she accepts the view that science in developing countries is transferred from the developed ones as a deliberate movement to incorporate them as their cultural (as well as economic and political) appendix. This purposeful action is said to be done through a variety of means, from programmes of international cooperation to the circulation of international journals. In consequence, the peripheral countries lose whatever previous culture they had, and cannot develop new knowledge on their own (33). There should be a deeper logic behind all this, and this is exactly what Rafael de la Cruz tries to provide in his article on 'The Origin and Climax of Specialists in Semi-Peripheric Venezuela' (*Ciencia academica*, 389–428).

Stripped of its heavy neo-Marxist jargon, Cruz's article can be seen as arguing that the increased number of university-level professionals in Venezuela is a direct consequence of its share in the international

division of labour of modern capitalism. Since advanced capitalist countries are transferring less sophisticated industries to newly industrializing countries, they need to grow a limited amount of trained manpower and technical skill in order to fulfil their task. This strictly functionalist approach is combined with a surprising demonstration of naïve evolutionism. For Cruz, what explains the conflicts between university-trained people and other sectors of the government is that they are at different levels of modernization. Neo-Marxist theory also holds that modern capitalism requires a new division of labour, with a new stress on technical and skilled personnel (which he calls 'intellectual employment'). To prove this, Cruz presents a table showing the percentage increases in productivity and 'intellectual employment' for 27 fields of industrial activity in Venezuela between 1971 and 1978. Visual inspection of his table shows that productivity often goes down when 'intellectual employment' goes up, and *vice-versa*; the correlation coefficient (which he does not calculate) is, in fact,  $-0.60$ . This, however, is explained away by the 'organic incorporation' of intellectual work in the headquarters of multinational corporations, and by the appeal to absolute growth of employment when relative figures do not conform. There is more intellectual conceit and simple-mindedness in Cruz's text than one could possibly deal with here. The basic point, however, is that his approach leaves no room for the most striking feature of Venezuela's development in the last decades, which is precisely the lack of correspondence between its educational and scientific growth and the economic and employment structure it developed. It also leaves him unable to understand the limited but significant achievements of Venezuelan academic science and technology in the last decades. In order to do that, he should probably have to read some Max Weber – but Weber, for him, is too 'positivist' to be taken seriously (392). Cruz's assumptions do not differ much from the economists of the so-called 'human capital' school. For them, science, technology and higher education are more or less the same thing, to be explained by the growth of capitalism and its vagaries in less developed regions. The failure of the 'human capital' theorists, well demonstrated by Tovar and Negretti in the article that follows Cruz, can also be taken as a demonstration of the failure of the latter's thesis.

The ideological climate of post-*Renovación* in Venezuela is probably the best explanation for the presence of this kind of pseudo social science in an otherwise rich and complex collection of articles. Vessuri herself, after paying her duties to *dependencia* theory and Marxist structuralism, goes on to say that 'scientists in underdeveloped countries are not

passive beings' and can react against so many determinisms (*Ciencia academica*, 33). Through this window springs a wealth of possibilities. It opens the way for the study of the social history of chemistry, biology, engineering, computer science, law and mathematics; for looking at teaching, academic research and technological development as different and often conflicting sources of intellectual growth and education; and for examining in detail the peculiar history of institutions such as the Instituto Venezolano de Investigaciones Cientificas or the CONICIT. The final picture is much richer, dense and contradictory than the initial assumptions would lead one to expect, and provide a particularly insightful view of contemporary Venezuela – and, by implication, of many other countries with similar or contrasting experiences.

#### • NOTES

1. Unesco, *Statistical Yearbook* (Paris: Unesco, 1984), Tables 2.10 and 3.2.
2. Expenditure *per capita* in R&D was around US\$15.80 in 1977, as against \$10.00 for Brazil and an average of \$3.30 for Latin America (the European average is around \$80.00). See F. Sagasti et al., *Un decenio de transicion: ciencia y tecnologia en America Latina y el Caribe durante los setenta* (Lima: Grupo de Analists para el Desarrollo, 1983, mimeo), *passim*.
3. See Daniel C. Levy, *University and Government in Mexico: Autonomy in an Authoritarian System* (New York: Praeger, 1980).

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